**Team: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ #:**\_\_\_\_\_\_ Score:\_\_\_\_\_\_

**2015 BCS Disease Detectives Test**

General Knowledge (50 pts)

1. Fill in the blanks

Use: Virus, Bacteria, Fomite, Pandemic, Epidemic, Hyperendemic, Vehicle, Zoonosis, Agent, Vehicle, Vector, Outbreak, Fungus, Reservoir, Contagious, Infectious, Host, Systematic, Random, Herd Immunity, Active Immunity, Passive Immunity

1. A(n) \_\_**epidemic**\_\_ is when a disease that spreads rapidly within a population and is considered highly serious.
2. A(n) \_**reservoir**\_\_\_ is a place where agents reproduce
3. A(n) \_**contagious**\_ disease is capable of being transmitted person to person
4. A(n) \_**pandemic**\_ is when a disease spreads across large regions, to more than one population.
5. A(n)\_**vector**\_\_ carries a disease to another organism but does not contract the disease itself.
6. A(n) \_**fomite\_** is a surface that a pathogen can thrive on and can pass the disease to other hosts.
7. \_**Random**\_\_error can be reduced by increasing sample size
8. A(n) \_**Infectious\_** disease is one that is caused by biological organisms.
9. \_**Herd Immunity**\_ is when a group is resistant to an outbreak because not enough susceptible hosts are present.
10. \_**Zoonosis**\_\_ is when a human contracts an animal disease.
11. A(n) \_**fungus**\_ is an infectious agent that spreads by spores.
12. A(n)\_\_**outbreak**\_ is the occurrence of a particular disease in a small, localized group.
13. \_**Passive Immunity**\_\_\_ to a disease can be given to a newborn through the umbilical cord.
14. \_**Hyperendemic**\_\_ describes a disease that is always prevalent at above-average levels in a certain population.
15. What are the three elements of the epidemiologic triad in the traditional model of infectious disease?

**Agent, Host, Environment**

1. Concisely list the ten steps of investigating an outbreak (5).

***Grade leniently, as sources vary, 0.5 for each correct one, ordering can be slightly shifted***

1. **Identify resources/prepare for field work/establish investigation team**
2. **Establish existence of outbreak**
3. **Verify the diagnosis**
4. **Define the case**
5. **Identify and count cases**
6. **Perform descriptive epidemiology**
7. **Develop hypothesis**
8. **Evaluate hypothesis/Reconsider and refine hypothesis/perform more studies**
9. **Implement control**
10. **Communicate findings**
11. **(In case previous where combined) Maintain Surveillance**
12. Watch the following diseases with their transmission: (3, 0.5 each)
13. \_\_**4**\_\_ Bacterial Conjunctivitis 1. Foodborne
14. \_\_**5**\_\_ HIV                                 2.Airborne
15. \_\_**2**\_\_ Tuberculosis                                 3. Waterborne
16. \_\_**1**\_\_ E. Coli 4. Direct Contact
17. \_\_**3**\_\_ Cholera5. Bodily Fluid
18. Match the following diseases with the agents that cause it. Agents may be used more than once (3, 0.5 each)
19. \_\_**1**\_\_ Anthrax                                      1. Bacteria
20. \_\_**3**\_\_ Chickenpox                                 2.Animal
21. \_\_**4**\_\_ Ringworm                                 3. Virus
22. \_\_**2**\_\_ Lyme disease                                  4. Fungus
23. \_\_**1**\_\_ Strep Throat                 5. Protist
24. \_\_**5**\_\_ Malaria
25. \_\_\_\_ Why are colds more common in the winter?
    1. The cold weather suppresses one’s immune system
    2. Cold viruses reproduce faster in lower temperatures
    3. Students are not in school in the summer, and most colds spread in schools
    4. **People are in closer contact when the stay inside in the winter.**
    5. There actually is no trend that suggests colds are more common in the winter.
26. \_\_\_\_Coming into contact with an infectious agent is a \_\_\_\_\_\_\_ cause of disease:
    1. **Necessary**
    2. Sufficient
    3. Component
    4. Primary
    5. None of the above
27. \_\_\_\_ Smoking is a \_\_\_\_\_\_\_ cause of lung cancer:
    1. Necessary
    2. Sufficient
    3. **Component**
    4. Primary
    5. None of the above
28. \_\_\_\_ A health professional studies the occurrence of a disease to determine risk factors and possible causes. This is an example of:
    1. Public Medicine
    2. Descriptive Epidemiology
    3. Determinant Epidemiology
    4. **Analytic Epidemiology**
    5. Preventive Medicine
29. \_\_\_\_ Food-borne transmission can also be classified as: (1)
    1. Reservoir-Induced Transmission
    2. **Vehicle Transmission**
    3. In Vidrio Transmission
    4. Multiple of the Above
    5. None of the above
30. \_\_\_\_ If you are not running your own clinical study, but rather performing calculations pertaining to how other people processed their data, what are you carrying out?
    1. **Meta-Analysis**
    2. Systematic Review
    3. Secondary Research
    4. Observational Trials
    5. Plagiarism
31. \_\_\_\_ If you are examining other studies, and providing a summary of the studies rather than performing additional statistical manipulation, what are you carrying out?
    1. Meta-analysis
    2. **Systematic Review**
    3. Tertiary Research
    4. Experimental Trials
    5. Plagiarism
32. \_\_\_\_ A health researcher notices that students in warmer regions are more likely to have diabetes than students in colder regions. However, the researcher does not take into account that the students in the warmer region eat more ice cream and ice cream contributes to diabetes. In this case, ice cream is a \_\_\_\_\_\_\_ variable:
    1. Red herring
    2. Relative
    3. Control
    4. Subcausal
    5. **Confounding**
33. \_\_\_ What is an example of an ecological survey?
    1. An attempt to navigate an ecosystem to determine if a disease causing agent is present.
    2. **Comparing the prevalence and exposure to diseases in different geographic locations.**
    3. Evaluating a patient’s living environment and outdoor activities to identify the location of an agent.
    4. Charting animal population growth by region.
    5. All of the above
34. \_\_\_\_ What does RCT stand for?
    1. Realistic Collaboration Trail
    2. Realistic Coherence Trial
    3. **Randomized Control Trial**
    4. Randomized Correspondence Trial
    5. None of the above
35. What are the two groups in an RCT? (1)

**Experiment(al) and control**

1. Identify the type of bias present in the following scenarios. Use: Selection bias, recall bias, non-response bias, Berkson bias, interviewer bias, surveillance bias (8, 1 pt each)

a. A hospital researcher studying Encephalapagos uses patients diagnosed with Encephalapagos as his “case” and other hospital patients as “control” subjects. **Berkson Bias**

b. Believing it caused his disease, Peter thinks about every time he consumed ham, while unaffected patients underestimate how much they eat ham. This affects survey results.

**Recall bias**

c. A researcher notices that wealthy patients are more likely to be diagnosed with asymptomatic heart arrhythmias, but does not consider this is because they are more frequently checked for heart arrhythmias during yearly checkups.

**Surveillance bias**

d. A researcher notices symptoms of a disease in a research subject and asks him different questions.

**Interviewer Bias**

e. In attempts to find the frequency of colds for an average adult, a researcher uses a school district’s mailing list to send out surveys.

**Selection bias**

f. Subjects are asked to come to the hospital for a study on the prevalence of mobility issues in the community.

**Non response bias**

g. A health researcher wants to determine the prevalence of Diseasus Obscurius by posting a survey on a Diseasus Obscurius support website.

**Selection bias**

h. A researcher has a hypothesis that people who sleep on the right side of the bed are smarter, and subconsciously gives them easier questions to measure their intelligence.

**Interviewer bias**

Case Study I (15 pts)

Jedi syndrome is a chronic condition characterized by fast-reflexes, the capacity for telekinesis, force-sensitivity, and headaches. A blood test reveals that all Jedis have a high midi-chlorian count.

**Specific Criteria**

* Reflexes under 0.01 seconds to any sensory stimulus
* The ability to move a 1g sphere 10 cm without physical manipulation
* Measurable electrochemical response to changes in force, simultaneously felt as sensation to patient
* Headaches that occur at least three times per week
* Over 9000 midi-chlorian (MC) per red blood cell

1. Which criterion is exclusively a symptom? **Headache**
2. Which criterion is exclusively a sign? **Blood count**
3. \_\_\_ Which is an example of something that could lead to recall bias?
   1. **A patient estimates that he has had 3 headaches in the past week.**
   2. A patient moves a 1g sphere 11cm, but the researcher only records it as 9cm.
   3. The syringe used to take the patient’s blood already has 1000 midi-chlorian.
   4. The patient physically moves the 1g sphere without the health official noticing.
   5. All of the above

**Case Classifications**

Suspected case: Telekinesis or Force-sensitivity

Probable case: Force-sensitivity with at least two accompanying symptoms

Confirmed case: Three of the four symptoms and a midi-chlorian (MC) count of over 9000 per cell.

1. Classify each case according to the classification definitions: (4, 1pt each)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ID | Headache | Telekinesis | Force-  sensitive | Fast reflexes | MC count | Classification |
| L | Y | N | N | Y | 4729 | **Not a Case** |
| M | N | Y | Y | Y | 10231 | **Confirmed** |
| N | Y | N | Y | N | Pending | **Suspected** |
| O | Y | Y | Y | N | N/A | **Probable** |

1. Why isn’t headaches a valid criteria for a suspected case? (1)

**Too many causes**

1. Researchers want to study the causes of chronic Jedi syndrome, which is not especially harmful. Would they want to use a specific or sensitive case description? Why? (2)

**Specific, prevent incorrect data from clouding cause**

1. In the previous problem, which of the classifications above would be used?  (1)

**Confirmed**

1. If instead Jedi Syndrome was a deadly, highly contagious infection, would they want to use a specific or sensitive case description? Why? (2) **Sensitive, so they can be sure to treat/contain every possible case**
2. Doctors are required by law to report cases of Jedi syndrome to the health department. Give two reasons why the health department might underestimate the frequency of Jedi syndrome in the population. (2)

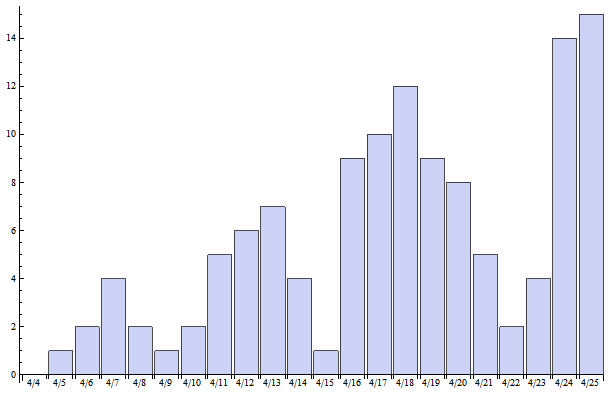
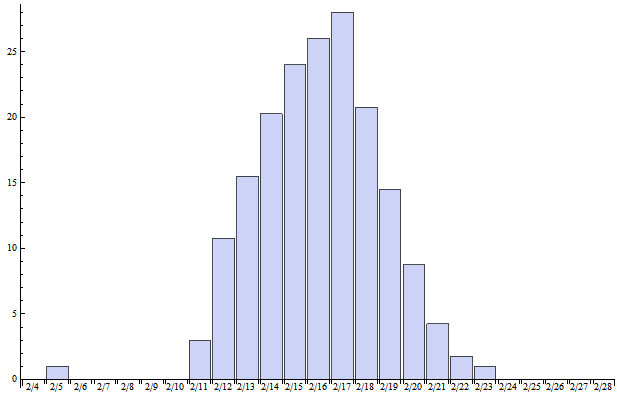
**Patients don’t seek medical attention, doctors misdiagnose, doctors don’t report (pick 2)**

Case Study II (15 pts)

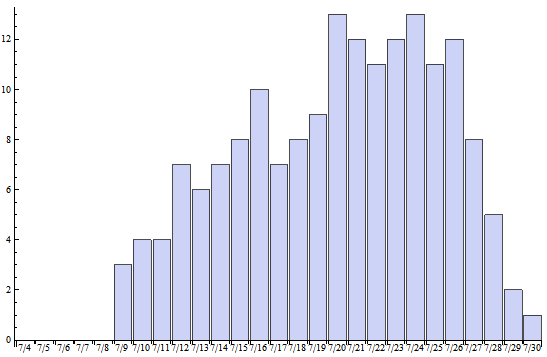
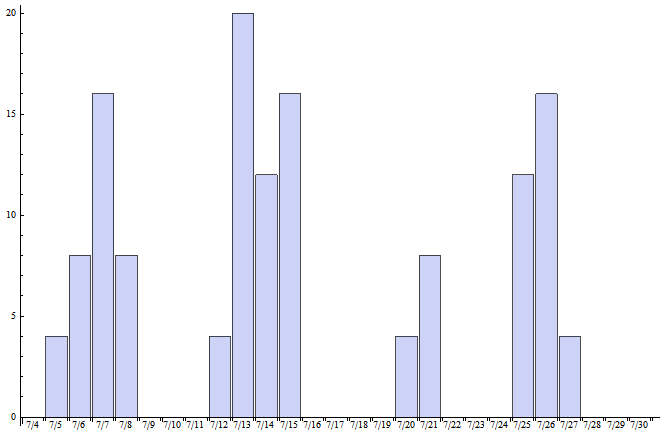
Hogwarts has recently had a problem with outbreaks. In the last year, they had four outbreak. Seeking to improve public health, they have decided to research the outbreaks. However, they have mixed up the case files, and they need to be resorted.

The graphs below show the number of cases that appeared over time. Each column represents one day.

**A) B)**



**C) D)**



1. What is the proper name for this type of graph in general?(1) **Epidemic curve**
2. Match each of the following scenarios with the graph that most likely represents them:

\_**C**\_Every week, undercooked pork is served in the Great Hall.

\_**A**\_Harry has mononucleosis and drinks from the Goblet of Fire. Later at a party, hundreds of other wizards drink from the same goblet.

\_**D**\_Voldemort contaminates the water supply with a persisting poison.

\_**B**\_Students regularly attend classes despite having contagious spattergroit

1. Determine whether each of the graphs show a propagated outbreak, point source, intermittent outbreak, continuous source outbreak, or mixed outbreak.

A. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Point source**

B. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Propagated**

C. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Intermittent**

D. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Continuous**

1. What is the minimum, average, and maximum incubation period for the infection in graph A?

Minimum: \_\_\_**6**\_\_\_ days Average \_**11-12**\_ days Max \_**18**\_ days

1. What is the average incubation period for the infection in graph B?

**5-7 days**

1. What is the difference between latency and incubation periods? (2)

**Latency is for chronic disease (1), incubation is for infectious (1)**

Case Study III (20 pts)

After the human race grows to an unsustainable size and depletes the earth of its resources, an expeditionary group of 1200 humans is sent to the planet of Pandora. The planet Pandora had previously had a population of 3460 Na’vi.

Soon after the humans arrive at Pandora, both humans and Na’vi begin falling ill with a hippopotovirus. The hippopotovirus can be contracted through drinking contaminated water, or coming into contact with the fluids on an infected person. The only symptom of this virus is a fever, which can sometimes be fatal. All Na’vi and humans are subjected to a blood test to establish who has contracted the virus.

You conduct a case-control study and find the following results:

Out of the native Na’vi, 2200 contracted the hippopotovirus, 1400 of whom had consumed water from Pandora. Additionally 800 patients drank the water without contracting the hippopotovirus. 2000 of the Na’vi patients that contracted the hippopotovirus had a fever, and 800 died from their fever.

800 of the humans had consumed Earth water recently enough for it to cause infection. Of those 800, 350 contracted the hippopotovirus. An additional 40 became infected without consuming Earth water. 300 human patients that contractacted the hippopotovirus had a fever, and 250 of those died.

1. By making data tables and carrying out risk calculations, formulate and present a hypothesis on whether it was more likely that Earth water or Pandora water was contaminated.

**SAMPLE**

**Na’vi Population/Pandora Water Human Population/Earth Water**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Sick** | **Well** |  |  | **Sick** | **Well** |
| **Exposed** | 1400 | 800 |  | **Exposed** | 350 | 450 |
| **Not Exposed** | 800 | 460 |  | **Not Exposed** | 40 | 360 |

**Odds Ratio: Odds Ratio:**

***The Na’vi’s odds ratio shows that those that drank Pandora water were no more likely to become sick than the rest of the population. The human’s odds ratio shows that those that consumed water are much more likely to get sick.* This suggests that the virus originated in the Earth water supply.**

**Scoring:**

* **1 point for drawing 2 2\*2 tables.**
* **1 point for the numbers in the Na’vi 2\*2 being correct**
* **1 point for the numbers in the human 2\*2 being correct**
* **1 point for both tables having labels and title**
* **2 points for correctly setting up both odds ratios (OR 1 pt for two relative risk calculations)**
* **2 points for both odds ratios correct**
* **1 point for giving some explanation of what the odds ratio means (italics)**
* **1 point for saying Earth water was contaminated**

**For a total of up to 10 pts**

1. Is the hippopotovirus more pathogenic in the Na’vi or human population? Explain. (4 pts)

**2000/2200=90.9% of the infected Na’vi were symptomatic (1)**

**300/390=76.9% of the infected humans were symptomatic (1)**

**Since a higher percent of infected Na’vi are symptomatic, it is more pathogenic in the Na’vi community. (1 pt for correct answer, 1 for some explanation)**

1. Is the hippopotovirus more virulent in the Na’vi or human population? Explain. (4 pts)

**800/2000=40% of symptomatic cases were fatal in Na’vi (1)**

**250/300=83.3% of symptomatic cases were fatal in humans (1)**

**Since a higher percent of symptomatic cases were fatal in humans, it is more virulent in the human community. (1 pt for correct answer, 1 for some explanation)**

1. In this case, why was it important to use a case-control study as opposed to a cohort study? (2 pts)

**Cohort Studies take much more time to carry out than case control studies (1). Since the virus is lethal, the study should not take much time. (1)**

Tie Breaker

1. What disease did the first successful vaccine defend against?

**Smallpox**

1. When it was founded in 1946, what did CDC stand for?

**Communicable Disease Center**

1. The end of what event in the 1970s caused a peak in the number of Malaria cases in the United States?

**Vietnam War**